Space Weather Forecast

Issued on Saturday, 14 January 2023 at 12:43 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Moderate-class X-ray flares and R1/R2 radio blackouts likely.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate over the last 24 hours, with a long-period Moderate-class X-ray flare at 14/0207UTC seen from a rapidly-emerging sunspot group in the Sun's northeast. This sunspot showed significant arcing towards the solar equator during the flare, however no obvious Coronal Mass Ejection (CME) has since been identified on satellite imagery.

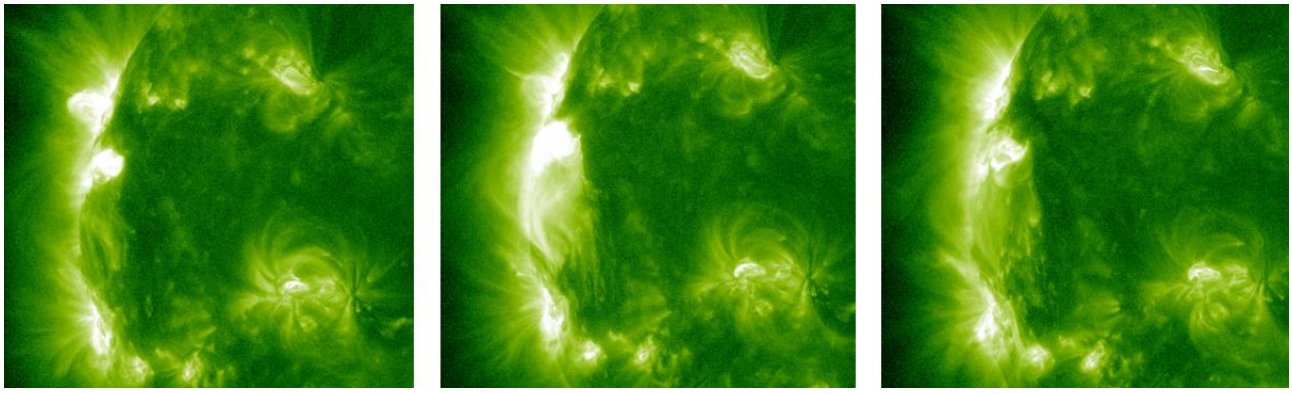

Figure 1: False-colour extreme UV imagery sequence from 14/0005 through 14/0215 to 14/0700UTC, showing the long-period Moderate-class X-ray flare from an arriving and growing sunspot region near the eastern solar horizon.

This sunspot itself lies in the vicinity of numerous active regions, with up to 13 total on the Sun's facing side at present. This group showed rapid development, with areal growth and proliferation of its constituent spots throughout. Other main events on the Sun were the development of up to three small regions; the approach of a hitherto large and active sunspot group to the southwestern solar horizon making difficult to analyse; and finally the large areal size of a sunspot group in the southeast. This final group may yet reveal more spots as it more fully rotates into view.

No new Earth-directed CMEs have been identified on available imagery, including resulting from the aforementioned Moderate-class X-ray flare, although this is being monitored. Also of note were possible 'disappearing filaments' (possible CME precursors) close to the northeastern solar horizon at 14/0830UTC and the southeast at 14/1100UTC. A southwest-heading CME seen in satellite imagery during the UTC afternoon of Friday 13 January has been analysed as a miss, to no effect at Earth.

Solar Wind / Geomagnetic Activity: The solar wind showed an initial decline suggestive of a possible gradual exit from a coronal hole fast wind regime. Around 13/2000UTC, this trend was abruptly interrupted in a number of measures by presumed 09 January CME influence.

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The solar wind speed was initially on a near-flat trend around Slightly Elevated levels, but showed a slight discontinuity upwards at 13/1800UTC and especially at 13/2000UTC to rise to an eventual Elevated peak. The number of particles comprising the wind rose from Background to a Slightly Elevated peak around 13/1830UTC, later moderating slightly. The magnetic field associated with these particles opened out through the duration of the early UTC evening to peak at Slightly Elevated levels, with the north-south component mainly anti-aligned with Earth's field during the UTC afternoon and early evening, but becoming more erratic thereafter.

The net effect of the above solar wind measures was for provisional peak of geomagnetic activity in the 21-24UTC interval, just shy of Minor Geomagnetic Storm G1.

Energetic Particles / Solar Radiation: Solar radiation reverted to Background levels in the wake of the slight enhancement entering the 24-hour period at 1pfu (i.e. below S1) earlier in the UTC day of 13 January.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to continue at Moderate levels, with a Slight Chance of a Strong (X-class) X-ray flare.

Solar Wind / Geomagnetic Activity: Earth should undergo gradual exit from the 09 January CME influence and the tail of a fast wind in the next 24 hours. An additional boost from a possible close pass of a CME may feature later in the UTC weekend, else activity should become increasingly quiet into the new working week.

Energetic Particles / Solar Radiation: Solar radiation should be at predominantly Background levels, but with a Chance of further enhancements which could produce an S1 or greater event through the period.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	10	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X	No	15	15	15	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	30	30	30	30
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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